



## Analysis of Motorcycle Accident Patterns and Safety Interventions in Thailand and Vietnam

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**Paper ID: 17A1G**

**Volume 17 Issue 1**

Received 05 March 2026

Received in revised form

29 April 2026

Accepted 02 May 2026

Available online 08 May

2026

**Keywords:**

Motorcycle accidents;  
UN Road Safety Fund;  
High-quality helmets;  
Thailand; Vietnam;  
Helmet compliance;  
Accident prevention;  
Alcohol-impaired  
driving; Road safety;  
Traffic enforcement;  
Motorcycle-based gig  
economy.

### Abstract

Thailand and Vietnam are Southeast Asian countries that their people use a lot of motorcycles. Motorcycles are 80% of all registered vehicles. Both nations are known for having the world's highest rates of road traffic fatalities. Motorcycles are involved in 74% of all road deaths. This paper offers a detailed analysis of motorcycle accident trends and the effectiveness of interventions. Both countries have strong safety rules, however their accident trends are not the same. This is because of things like road conditions, city density, and traffic law enforcement practices. Vietnam has made great progress in helmet usage and has seen a faster drop in death rates. In contrast, Thailand still has a higher overall death rate, mostly because of high-speed crashes in rural areas. Also, Thailand has a slow adoption of safety features like ABS. From mid-2025, Thailand raises fines to 2,000-4,000 baht for riders and passengers not wearing a helmet. Both countries also face issues, such as an aging population and the rise of the gig economy. This study offers policy recommendations aimed at boosting helmet use, improving enforcement for drunk driving, and aligning regional safety standards with the UNRSF Motorcycle Assessment Program.

**Discipline:** Civil & Traffic Engineering.

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### Cite This Article:

Witchayangkoon, B. B. (2026). Analysis of Motorcycle Accident Patterns and Safety Interventions in Thailand and Vietnam. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 17(1), 17A1G, 1-19. <http://TUENGR.COM/V17/17A1G.pdf> DOI: 10.14456/ITJEMAST.2026.7

## 1 Introduction

For countries of Southeast Asia, the motorcycle is not just a mode of transport, but it is also important to the economy and social life. In Thailand and Vietnam, motorcycles are the majority of registered vehicles and create a huge number of trips. This dependence on motorcycles is due to several reasons. For example, motorcycles are cheaper than cars; motorcycles can easily go through traffic jams, and also provide job opportunities.

However, using a motorcycle comes with a high human cost. The World Health Organization (WHO) has repeatedly listed Thailand as one of the most dangerous countries for road users. WHO

reported a road traffic death rate of 32.7 per 100,000 people in the 2024 data [4, 6]. Vietnam has made progress over the last ten years, but it still sees thousands of road deaths each year, with motorcyclists being the majority of those fatalities. Figure 1 shows Common motorcycle-involved accident types.

In Thailand, the 2025 death toll on the roads was more than 12,000, with over 90 percent—around 11,000 people—being motorcycle riders. This is not just a public issue. It is a development crisis that has serious impacts on the economy and societies. Each death means a family loses income, and dependents are thus pushed into poverty. Also, community strength becomes weakened.

Vietnam's situation, although not as high as recorded in global statistics, shows similar trends. The rapid increase in motorcycle use following the post-Đổi Mới economic changes has led to millions of motorcycles on roads that were built for much lower traffic and slower speeds. This has resulted in a continuous cycle of preventable deaths and injuries.



**Figure 1:** Common motorcycle-involved accident types.

This paper studies the comparative epidemiological profiles of motorcycle accidents in Thailand and Vietnam, focusing on mortality rates, injury patterns, and the demographic distributions of victims.

Also, this study investigates the primary behavioral, vehicle-related, and infrastructure-related risk factors that affect motorcycle accidents in both countries. Further, this work examines how the legal and regulatory frameworks governing motorcycle use compare, as well as the factors in enforcement effectiveness. This study will also identify intervention strategies that have proven effective in reducing motorcycle casualties and explore how these strategies have been used.

This discussion paper provides a comparative analysis of the current state of motorcycle safety in Thailand and Vietnam. It evaluates the epidemiological patterns of accidents and the relative success of various safety interventions.

## 2 Literature Review

### 2.1 The Epidemiology of Motorcycle Accidents in Thailand & Vietnam

Epidemiological methods are used in studying road traffic accidents and injuries. It focuses on analyzing, preventing, and reducing risks. It treats accidents as if they were a disease or health issue. It examines the distribution, causes (determinants), and patterns of injuries of populations to create effective safety strategies.

Motorcyclists are the most at-risk road user group. The rates of fatalities and severe injuries are hugely more than those of occupants in passenger vehicles. The work [13] showed a case of a motorcycle accident in Thailand on video footage.

In Thailand, the motorcycle safety crisis has just been recognized [7]. The WHO has put Thailand among the countries with the highest rates of road traffic fatalities worldwide [6]. Motorcyclists are the majority of these. It is known that the correct use of helmets can lower the risk of death by 42 percent and the risk of severe head injury by 69 percent. However, enforcement of helmet laws has long been inconsistent.

The pattern is both persistent and pervasive. From Thai government statistics and WHO assessments, for every 100,000 motorcycles on Thai roads, dozens of riders die every year. This rate has shown minimal improvement over two decades despite repeated policy commitments and international technical assistance.

**Table 1:** Thailand Road Accident data during 2009-2014 [14].

Casualties	2009	2010	2011	2012	2013	2014
Reported Accidents	93,923	83,336	68,781	61,194	61,323	62,494
Injuries	16,404	18,667	22,346	22,344	20,906	20,689
Death	5,722	7,996	9,496	8,745	7,364	6,336

**Table 2:** Thailand Road Casualties Data During 2021-2025.

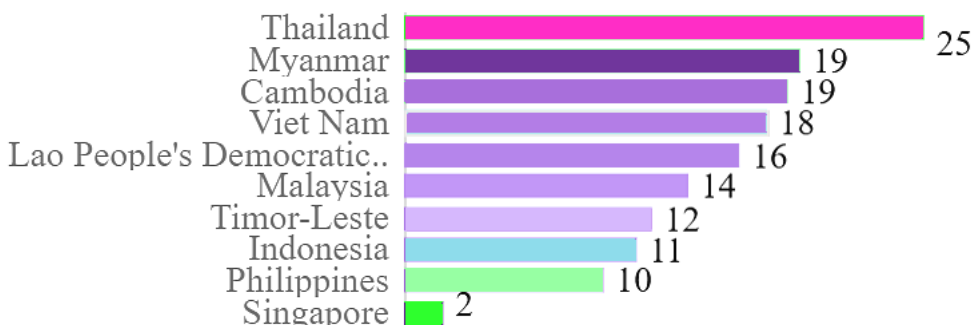
Casualties	2021 (2564)	2022 (2565)	2023 (2566)	2024 (2567)	2025 (2568)
Death (IDCC) [15]	16,957	17,379	17,498	17,477	16,078
Death per 100000 population (IDCC) [15]	25.92	26.65	26.86	26.85	24.73
Death (ThaiRSC [16])	13,425	15,015	14,122	14,177	12,536
Injuries (ThaiRSC [16])	879,940	926,893	808,724	855,080	863,410
Death from a motorcycle (ThaiRSC [16])	10,929	13,454	12,785	12,924	11,452

Vietnam's epidemiological profile mirrors key aspects of Thailand's, with unique characteristics. The mandatory helmet law in 2007 had short-term improvements. Helmet-wearing rates rose from 30 percent to over 90 percent in major urban areas. However, compliance has reduced over time outside these urban centers, particularly on rural roads and at night. There are concerns about helmet quality [9]. Car and motorbike accidents make up 45% of all traffic accidents. Accidents between motorbikes and motorbikes are 21% [8,10]. Since the mix of vehicles on the road is mostly made up of cars and motorbikes, the chances of accidents happening between these two types are greater than with other vehicles.

**Table 3: Vietnam Road Casualties Data During 2021-2025. [21,22]**

Casualties	2020	2021	2022	2023	2024	2025
Road Accident	14,982	11,493	23,354	22,075	21,532	15,251
Deaths	6,863	5,792	13,554	11,628	9,954	8,515
Injuries	N/A	N/A	N/A	N/A	16,044	N/A
Road traffic crash fatality rate per 100000 population	N/A	18	N/A	17.2	N/A	17.7

In 2025, Vietnam implements stricter regulations that include increased fines, vehicle confiscations, and license suspensions. The goal is to reduce violations and lower traffic accidents with these tougher enforcement actions [22].



**Figure 2: WHO road crash fatality rate (per 100000 population) in South East Asia countries (2021) [17].**

## 2.2 Risk Factors: Behavior, Vehicle, & Infrastructure

Behavioral factors are rider decisions and actions. It predominates in the Thai context. Chamaiphan Santikarn [6] indicated that the rates of death and injury from motorcycle accidents in Thailand have never shown a sustained declining trend. Dangerous behaviors include riding without a helmet and riding under the influence of alcohol. Other dangerous behaviors are speeding and violating traffic signals.

The helmet compliance gap is particularly stark. In 2022, 86.82% of motorcyclists who died in traffic accidents were not wearing a helmet at the time of the crash [2]. This indicates a failure of individual risk perception and enforcement systems.

Alcohol-impaired riding is also a critical risk factor. Studies from Khon Kaen University and other research institutions have documented that many fatally injured motorcyclists have blood alcohol concentrations exceeding legal limits. Weekend nighttime crashes show the highest numbers.

Motorcycle design and maintenance include motorcycle design and maintenance. It is under-addressed risk domains in both countries. Accidents may be caused by the lack of Antilock Braking Systems (ABS) on entry-level motorcycles and inadequate lighting systems. Also, the absence of standardized helmet quality requirements affects road accidents and injuries.

Recently, this gap has been addressed through global efforts. In February 2026, the UN Road Safety Fund [1] brought together partners for the first meeting of the Star Rating for Safer Motorcycles in Southeast Asia. This is a three-year project for creating a regional Motorcycle Assessment Program that follows UN guidelines. Vietnam, Thailand, Indonesia, and Malaysia join this program.

Infrastructure factors include road design, signage, and protective barriers. Roadside hazards are fixed objects such as utility poles, trees, and drainage culverts. These are overrepresented in fatal motorcycle crashes. Protective barriers are often designed for passenger vehicles, not motorcyclists, who require different protection geometries.

## **2.3 Helmet Effectiveness and the Compliance Challenge**

The strongest injury prevention is to use high-quality motorcycle helmets. This is because well-designed with correctly worn helmets can lower the risks of death by 42% and reduce severe head injuries by 69%. In the accident, a helmet helps save on medical expenses and lost work time.

The effectiveness of helmets relies on three key factors. First, the helmet must meet safety standards. Second, it must be worn correctly, with straps fastened and a proper fit. Third, it must be worn every time on every ride. Data from Thailand shows a serious failure in all these areas.

The fact that 86.82% of riders who died in crashes were not wearing helmets indicates not just a lack of compliance but a significant disconnect between the law and actual behavior on the road. This issue is even more pronounced for motorcycle passengers, who wear helmets at even lower rates than the riders themselves.

About this issue, the Royal Thai Police announced in May 2025 that they would be stepping up helmet enforcement. Starting June 1, 2025 [3,5], both riders and passengers are required to wear helmets or face fines of up to 2,000 baht, a big jump from the previous 500baht fine. The new rule also includes an important clause, i.e., if a rider is caught without a helmet while carrying a passenger who is also helmetless, the fine will double.

This regulatory change aims to fix a long-standing weakness in the enforcement of traffic laws in Thailand. Enforcement efforts have led to temporary increases in compliance. However, after a few months, the enforcement becomes weakened.

Vietnam's experience provides useful insights. The 2007 mandatory helmet law was supported by extensive public awareness campaigns and visible enforcement. It resulted in significant short-term road accident reduction.

## **2.4 Alcohol-Impaired Riding**

Alcohol-impaired driving is a risk factor for all vehicle types. It has a high effect on motorcycle crashes. The vulnerability to the motorcyclist, even modest blood alcohol concentrations, produces high increases in crash risk and injury severity.

In Thailand, alcohol-impaired riding is pervasive. Studies of fatally injured motorcyclists have found that a huge proportion had consumed alcohol before the crash, with weekend nighttime crashes showing the highest incidents. The combination of co-occurring risk factors of alcohol impairment and helmet non-use frequently produces severe outcomes.

Vietnam faces similar challenges. The rapid expansion of ride-hailing and food delivery services, which often operate late into the night, has created new patterns of alcohol-impaired riding among gig workers returning from shifts and among customers who have consumed alcohol before using ride-hailing services.

## **2.5 The Gig Economy and Commercial Motorcycle Use**

The emergence and explosive growth of motorcycle-based gig economy services—ride-hailing (e.g., Grab, Gojek, Be) and food delivery (ShopeeFood, GrabFood, LINE-MAN)—have fundamentally altered motorcycle use patterns across Southeast Asia.

As noted by the World Bank's Global Road Safety Facility in the context of the UNRSF Motorcycle Safety Initiative, commercial motorcycles represent a rapidly expanding but largely unregulated sector [11]. As these services drive job creation, safety must be part of that. Gig workers face pressures for tight delivery windows. It is with compensation structures that incentivize speed and indefinite working hours. This systematically increases crash risk.

The research on gig worker safety is still developing. From early studies, delivery riders experience much higher crash rates compared to non-commercial motorcyclists. Affected factors include fatigue from extended shifts, using phones while riding (for navigation and order management), and financial pressure to engage in riskier riding practices.

## **2.6 The UNRSF Motorcycle Safety Initiative and Regional Harmonization**

The February 2026 launch of the Star Rating for Safer Motorcycles in Southeast Asia represents a significant step toward regional harmonization of motorcycle safety standards. The three-year initiative, with UNESCAP as the lead agency, will establish a regional Motorcycle Assessment Program aligned with UN regulations.

The initiative comes at a crucial juncture. For years, the ASEAN region has lacked a standardized framework for evaluating motorcycle safety. Consumers have had no reliable information on which models offer superior protection. Governments have lacked evidence to support regulatory upgrades. Manufacturers have faced fragmented requirements across different national markets.

The new program will address this gap by developing a star rating system—a familiar and accessible format that communicates safety information to consumers—alongside technical assessments aligned with UN regulations. As noted in the project documentation, the initiative will give "consumers clearer information and supporting governments in raising safety standards".

Private sector engagement is central to the initiative's strategy. The inclusion of Autoliv, a global leader in automotive safety systems, emphasizes the importance of including passive safety technologies within the ASEAN MyMAP framework. MIROS has assessed 40 motorcycle models. This brings strong technical experience to support implementation.

The participation of Thailand and Vietnam reflects both their urgent need for motorcycle safety improvements and their potential to serve as regional models for successful application.

## 3 Methods

### 3.1 Research Design

This study uses a comparative case study design, examining motorcycle accident patterns in Thailand and Vietnam over the 2020–2025 period. The comparative method enables systematic identification of similarities and differences whereas attending to the distinct policy and implementation contexts of each country.

### 3.2 Data Sources

Data were drawn from multiple sources. For international datasets, data were taken from the WHO Global Status Reports on Road Safety, including fatality rates and risk factor prevalence estimates. For national road safety reports, data were taken from reports published by the Thai Department of Disaster Prevention and Mitigation, the Thai National Road Safety Committee, and Vietnam's National Traffic Safety Committee. In terms of peer-reviewed literature, information was taken from publications in journals related to traffic injury prevention, tropical medicine, and public health. For policy and regulatory documents, information was taken from legal texts, enforcement directives, and policy announcements from Thai and Vietnamese government sources, including the Royal Thai Police's May 2025 helmet enforcement directive [3,5]. From UN agency documentation, information was taken from project documents from the UN Road Safety Fund's Star Rating for Safer Motorcycles initiative [1].

### 3.3 Analytical Framework

The analysis is organized in four thematic domains.

1. Epidemiological patterns

2. Behavioral risk factors: Helmet compliance, alcohol-impaired riding, speeding
3. Regulatory frameworks and enforcement: Legal provisions, penalty structures, implementation intensity.
4. Vehicle and infrastructure factors: Motorcycle safety technologies, protective barriers.

## 4 Results

### 4.1 Epidemiological Profiles Compared

#### 4.1.1 Thailand

Thailand's road safety crisis is among the most severe globally. According to WHO data, Thailand's road traffic death rate stands at 32.7 deaths per 100,000 population [4]. It is among the highest world records. Motorcycles are involved in 77–84 percent of crashes. Head injuries are the leading cause of fatality.

The absolute scale of the crisis is staggering. Over the past five years, Thailand has averaged more than 17,900 road traffic deaths each year, with 22,8740 injuries recorded per year in the same period. Motorcycle riders account for 74.5 percent of all road deaths—meaning that approximately 12,600 of the annual fatalities are motorcyclists.

The helmet gap is catastrophic: in 2022, 87 percent of fatally injured motorcyclists were not wearing helmets at the time of the crash [12]. This indicates that thousands of deaths each year could have been prevented by helmet use alone.

Demographically, working-age adults (20–50 years) predominate among fatally injured motorcyclists. However, there is a troubling trend: the annual growth rate of fatalities among elderly road users stands at 5.45 percent, with older adults now comprising one-fifth of all traffic deaths.

#### 4.1.2 Vietnam

Vietnam's motorcycle fleet is among the largest in the world relative to population. It has an estimated 77 million registered motorcycles as of September 2025. The road traffic fatality rate has shown substantial improvement over the past two decades, declining from an estimated 25 per 100,000 population in the early 2000s to 20 per 100,000 in recent years [17].

Motorcyclists constitute 85-90% of road traffic in Vietnam [24]. It is estimated that 65–70% of road traffic fatalities. It is slightly lower than Thailand's proportion, but still a lot of deaths. Head injuries also predominate as the primary cause of death.

Vietnam's helmet law compliance experience is instructive. Following the 2007 mandatory helmet law, observed compliance in major cities such as Hanoi and Ho Chi Minh City surged to over 90 percent. By 2010, the estimated number of lives saved exceeded 2,000 deaths averted annually.

However, challenges persist. Compliance outside major urban centers is substantially lower, with some rural provinces recording rates below 50 percent. Helmet quality is a persistent concern: many helmets in use are substandard "half-helmets" that provide minimal protection. Nighttime compliance, particularly among younger riders, shows a huge drop from daytime rates.

### 4.1.3 Urban vs Rural Dynamics

In Vietnam, accidents are predominantly urban or peri-urban. The "chaos" of Hanoi or Ho Chi Minh City often results in a high frequency of low-to-medium speed collisions. Head injuries remain the leading cause of death [6].

In Thailand, urban congestion is a factor in Bangkok, where the highest fatality rates occur on inter-provincial highways. High-speed travel and collisions with larger four-wheeled vehicles are more common than in Vietnam.

### 4.1.4 Demographics

Observation shows a persistent "youth bulge" in accident statistics. In Vietnam, riders aged 25–49 represent the majority of victims [19], whereas in Thailand, the 15–24 age group remains disproportionately affected by speeding-related "near-miss" incidents [20].

## 4.2 Behavioral Risk Factors Compared

### 4.2.1 Helmet Use

Thailand's helmet compliance crisis is quantified above. A staggering 86.8% fatal injuries to riders are not wearing helmets. The trend of not wearing helmets differs based on the type of road, the time of day, and the demographics of the riders. The trend is lower on rural roads. It is lower at night compared to daytime. Younger riders and passengers tend to wear helmets less.

The enforcement boost planned for June 2025 is a major policy change. The increase in fines from 500 to 2,000 baht aims to create a strong financial deterrent against not following the traffic rules [3,5]. To put it in perspective, 2,000 baht is about 4 to 7 days' worth of wages for those earning minimum wage. This is a big penalty.

The law doubles fines if a rider is caught without a helmet while also carrying a passenger who is not wearing one. This targets a case that riders wear helmets, but their passengers do not.

Vietnam's 2007 helmet law compliance, they initially achieved high compliance. This is due to a mix of campaigns such as visible police enforcement, public awareness campaigns, and strong political backing. However, as the intensity of enforcement decreased over time. Compliance dropped, especially among passengers and on less busy roads. As of 2026, motorcycle riders and passengers in Vietnam who do not wear a helmet, or wear one unfastened, face a fine of 400,000 to 600,000 VND per person. This penalty applies to both drivers and passengers, and is strictly enforced in cities and on highways.

## 4.2.2 Alcohol-Impaired Riding

It is not easy to obtain reliable data on the rates of alcohol-impaired motorcycle riding. This is due to the sensitive nature of the behavior and riders' reluctance to admit to it. However, research on fatally injured motorcyclists has shown that a significant percentage. About 30-50% motorcycle riders consumed alcohol before their accidents.

In Thailand, the legal limit for Blood Alcohol Content (BAC) for motorcycle riders is 0.05% (50 mg/dL). But for those who have a temporary or provisional license, or have been riding for less than 5 years, the BAC limit is lower at 0.02% (20 mg/dL). A 0.05% BAC is generally reached after approximately 2 standard drinks in the first hour for an average male, and 1 standard drink per hour for women. While 0.05% is the legal limit in many regions, individual factors like body weight, food consumption, and metabolism mean there is no guaranteed safe amount.

This issue is acute on weekends and during holidays. Thailand's "Seven Dangerous Days" (the Songkran and New Year holiday periods) consistently show higher alcohol involvement in crash statistics, despite ongoing public awareness efforts and increased law enforcement presence.

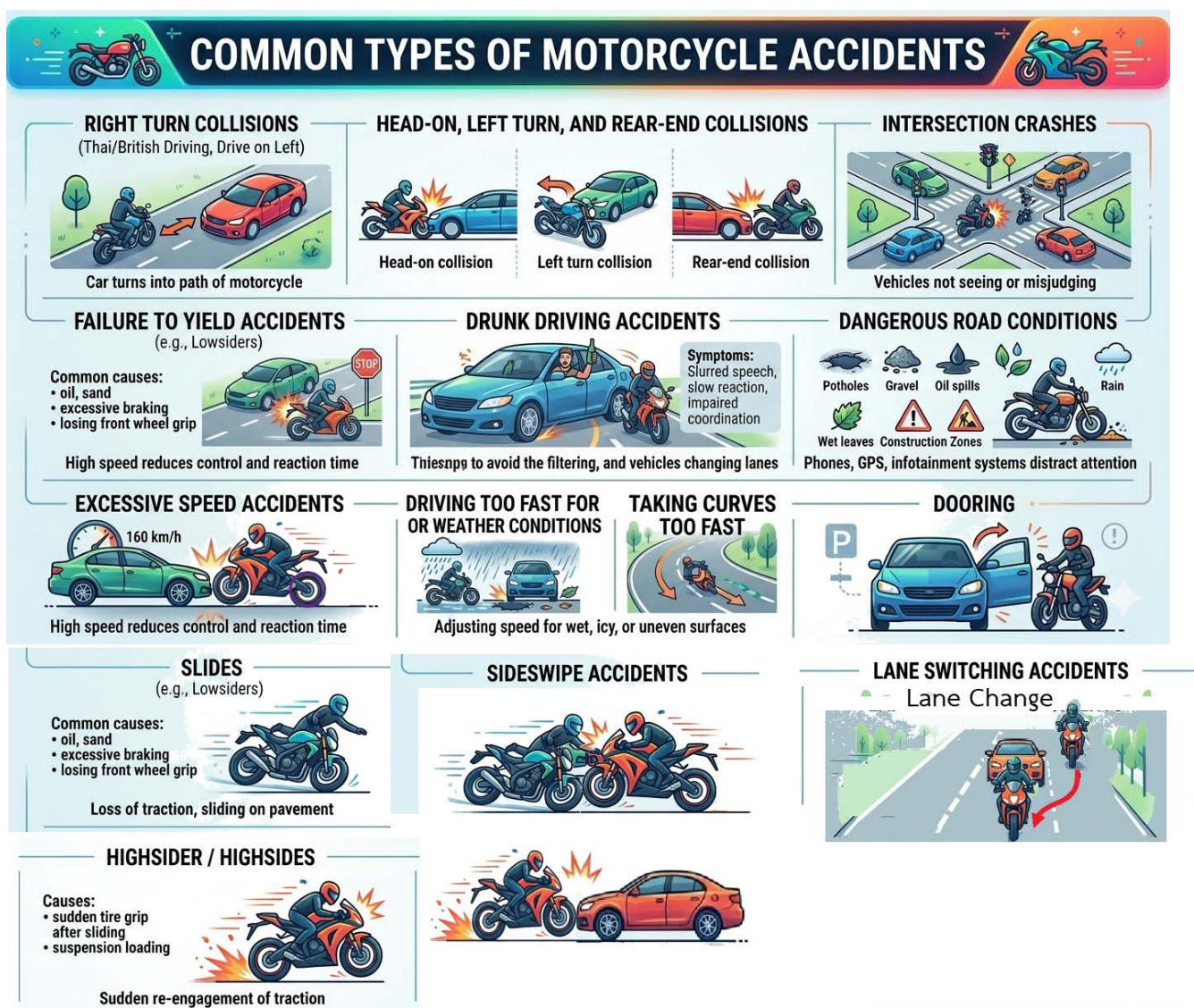


Figure 3: Common types of motorcycle accidents.

In Vietnam, the law prohibits driving with a blood alcohol concentration above 0.0 percent (zero tolerance) for all vehicle operators. This is a stricter standard than that of Thailand. However, data on enforcement and compliance are scarce.

### 4.2.3 Speeding

Excessive and inappropriate speed is a common factor in fatal motorcycle accidents in both countries. The unprotected nature of riders means that even small speed increases can lead to a lot higher fatality risk. The likelihood of death in a crash rises with the square of the riding speed. If you multiply your speed, you must multiply the risk by that same number twice, Table 4.

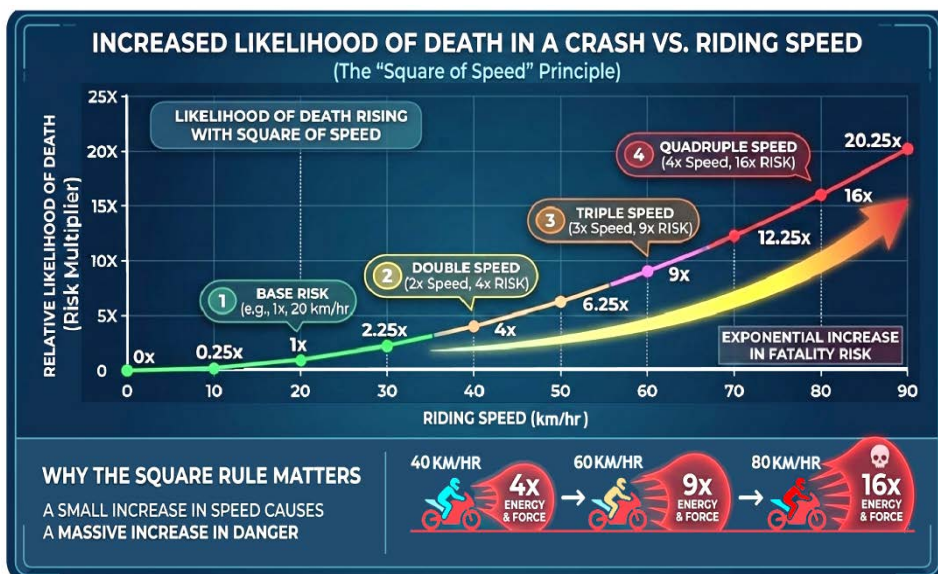
**Table 4: Risk of death due to double/triple/quadruple riding speed.**

Riding Speed	Risk effect
Increase speed by 50%	Your risk of death is not 1.5 times. It increases by 2.25 times (1.5x1.5).
Double your speed (2x)	Your risk of death does not double. It increases by 4 times (2x2).
Triple your speed (3x):	Your risk of death increases by 9 times (3x3).
Quadruple your speed (4x)	Your risk of death increases by 16 times (4x4).

A moving motorcycle builds up kinetic energy ( $KE$ ), according to

$$KE = \frac{1}{2}mv^2 \tag{1}$$

where  $v$  is the velocity/speed of the mass  $m$  of the moving motorcycle (including the mass of the rider and passengers). Because speed is squared, the energy your body must absorb during a sudden stop multiplies aggressively with every extra speed. See example in Figure 4 with the base speed at 20 km/hr.



**Figure 4: Relative likelihood risk of death in a crash vs riding speed (base speed 20 mph).**

Quantifying the prevalence of speeding is difficult. Observational studies and self-report surveys present it as a common behavior, especially for younger riders.

## 4.3 Regulatory Frameworks and Enforcement

Table 1 shows the regulatory frameworks and enforcement in Thailand and Vietnam.

**Table 5: Comparison of Legal Frameworks and Enforcement for Thailand and Vietnam.**

Thailand	Vietnam
<b>Legal framework</b>	
<p>Thailand has a thorough legal framework for road safety on paper. The Land Traffic Act sets out road rules, vehicle equipment standards, and licensing requirements for operators. The helmet law has been mandatory for many years.</p> <p>However, there has been a significant gap between the law and its enforcement. Limited resources for enforcement, inconsistent penalties, and a culture of impunity have weakened the effectiveness of legal measures.</p>	<p>Vietnam has been steadily improving its legal framework, especially regarding helmet use and driving under the influence of alcohol. The zero-tolerance law for drunk driving, which took effect in 2020, is one of the strictest in the region.</p>
<b>Enforcement</b>	
<p>The enforcement enhancement planned for mid-2025 aims to bridge this gap. The Royal Thai Police's "Safe Roads Project" targets busy areas, roads with frequent violations, accident hotspots, and places near schools. The collaboration with the Ministry of the Interior and local authorities shows a comprehensive government approach, involving local governments, educational institutions, and public-private partnerships working together to improve road safety.</p> <p>It remains to be seen if this initiative will lead to lasting improvements. Previous enforcement efforts have resulted in temporary spikes in compliance that faded after the campaigns ended.</p>	<p>Like Thailand, Vietnam faces enforcement challenges such as limited resources, inconsistent application, and the complexities of monitoring widespread road networks. However, Vietnam's political system allows for quicker, top-down implementation of policies compared to Thailand, which may account for some differences in compliance results.</p>

## 4.4 Vehicle and Infrastructure Factors

### 4.4.1 Motorcycle Safety Technologies

The ASEAN region has fallen behind global markets in the implementation of motorcycle safety technologies. Antilock Braking System (ABS) is compulsory for new motorcycles in the European Union and other regions. Research indicates that ABS can reduce crash occurrences by 26–33% [4.2]. Under new Thailand legislation effective 2024 [4], new motorcycles exceeding 125 cc are required to be equipped with ABS to prevent wheel lock-up during sudden braking. This results in better vehicle control and a reduced risk of accidents. Vietnam has put standards into its National Technical Regulations, specifically targeting the new influx of electric motorcycles. In Vietnam, new Honda motorcycle 2026 models and some Yamaha models are equipped with ABS.

The UNRSF Motorcycle Star Rating initiative directly tackles this issue. By creating a regional assessment program that aligns with UN regulations, the initiative seeks to "provide consumers with clearer information and assist governments in enhancing safety standards."



**Figure 3: Motorcycle ABS.**

The participation of Autoliv, which focuses on incorporating passive safety technologies within the ASEAN MyMAP framework, suggests that the initiative will cover both active safety (ABS, traction control) and passive safety (helmet standards, protective clothing) aspects.

#### **4.4.2 Infrastructure**

The road infrastructure in Thailand and Vietnam has primarily been designed for motor vehicles, with minimal consideration for the safety of motorcyclists. The roadside environment includes utility poles, trees, drainage culverts, and fixed signs. These pose specific dangers for motorcyclists who veer off the roadway. Protective barriers (guardrails) are mostly designed for passenger vehicles. In some cases, protective barriers may heighten the risk of injury for motorcyclists who collide with them.

### **4.5 Emergent Challenges**

#### **4.5.1 Rider Aging**

Thailand's population is experiencing rapid aging, and the motorcyclist demographic is following suit. The alarming 5.45 percent annual increase in traffic fatalities among elderly road users is a significant concern. Older riders encounter heightened risks due to slower reaction times, diminished visual acuity, increased use of medications, and greater physical susceptibility to injuries.

#### **4.5.2 Gig Economy Motorcycle Use**

The rapid expansion of motorcycle-based delivery and ride-hailing services has introduced new risk patterns. As highlighted in UNRSF documentation, commercial motorcycles constitute "a swiftly growing yet largely unregulated sector."

## 5 Discussion

### 5.1 Interpreting the Comparison: Similarities, Differences, and National Trajectories

The comparative analysis includes convergence and divergence. Thailand and Vietnam show fundamental structural similarities. The transportation systems and tropical climates are similar in riding conditions. Also, regulatory frameworks appear comprehensive in theory but are inadequately enforced in practice.

However, the national paths differ. Vietnam's significant improvements in helmet compliance since 2007—despite recent declines—constitute a public health achievement that Thailand has yet to match. Thailand's initial fatality rate is considerably higher, and its gap in helmet compliance is more pronounced.

The enforcement enhancement scheduled for June 2025 in Thailand signifies a recognition that previous strategies have been ineffective. The substantial increase in fines and the focused approach towards passenger non-compliance aim to address critical deficiencies. The success of this initiative in fostering lasting change hinges on two key factors: firstly, the consistency and visibility of enforcement; secondly, the implementation of complementary measures that tackle other risk factors (such as alcohol consumption, speed, and vehicle safety).

### 5.2 The Helmet Compliance Gap: Explaining Thailand's Failure

The statistic indicating that 86.82 percent of fatally injured Thai motorcyclists were not wearing helmets at the time of the crash is alarming. It suggests that thousands of fatalities each year could have been avoided through this single, cost-effective intervention.

Several reasons make this ongoing failure. First, historical penalties were insufficiently severe. The previous fine of 500 baht was, for many riders, a negligible expense—less than the cost of a family meal. The new penalty of 2,000 baht serves as a more significant deterrent, although it remains modest in relation to average income levels.

Second, enforcement has been erratic. Even when fines were established, the likelihood of being penalized for non-compliance was low. Thus, riders rationally minimized the anticipated costs associated with non-compliance.



**Figure 4:** Retro half helmets and fancy scoop helmets.

Third, cultural elements are influential. The sense of invulnerability, especially among younger riders, diminishes risk-reduction behaviors. The popular sub-standard helmets are often referred to as yogurt tub helmets, retro half helmets, and scoop helmets (Figure 4). These may offer minimal protection, suggesting that even when helmets are worn, the level of protection may be insufficient. Figure 5 shows details of high-quality helmets.

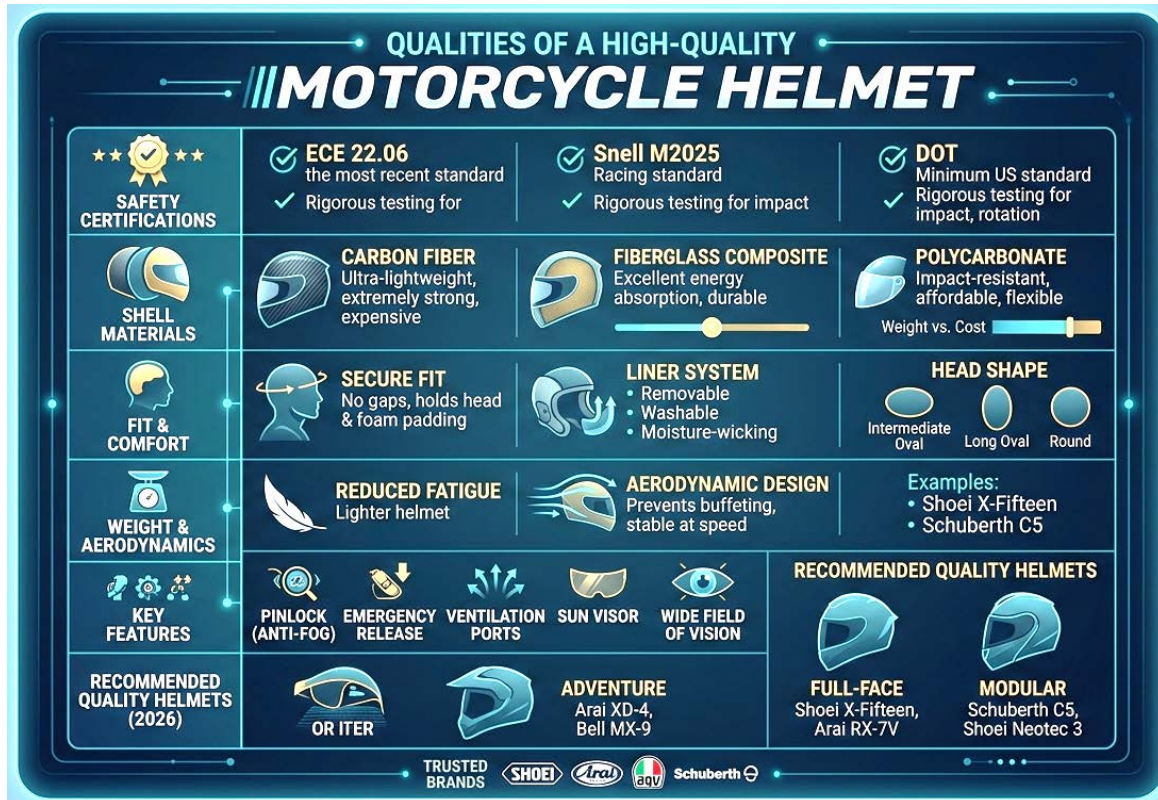


Figure 5: Details of high-quality motorcycle full-face helmets.

Vietnam’s 2007 mandatory helmet law was successful, getting nearly 90% compliance. However, by 2026, the focus had shifted to helmet quality. Vietnamese regulations under the QCVN framework now focus heavily on material composition to prevent 'shell-only' helmets that offer no impact protection [6,23].

In contrast, Thailand’s challenges remain. While compliance is high in major cities, rural compliance is less than 50% in most provinces.

### 5.3 The Challenge of Alcohol-Impaired Riding

Alcohol-impaired riding continues to pose a significant challenge in both nations. The interplay of alcohol consumption (common in both cultures) and motorcycle usage (crucial for mobility) leads to predictable consequences.

The "Seven Dangerous Days" holiday periods in Thailand—characterized by a dramatic increase in road fatalities—are largely influenced by alcohol consumption during holiday festivities. Despite extensive public awareness initiatives, this trend remains unchanged.

Vietnam's zero-tolerance policy on drunk driving, enacted in 2020, signifies a more rigorous legal framework compared to Thailand's. Nevertheless, the effectiveness of this stricter regulation in reducing alcohol-impaired riding will depend on enforcement and compliance metrics.

### 5.4 Infrastructure, Urban Design, and the Overlooked Aspect

It is important to have good, safe motorcycle-friendly infrastructure to safeguard riders' lives. Figure 6 shows the road infrastructure iRAP rating for motorcyclists. Figure 7 shows the key safety factor rating according to the iRAP. For Vietnam, 38% of road infrastructure has a 3-star or better iRAP rating for motorcyclists [2.1].



Figure 6: Road infrastructure iRAP rating for motorcyclists

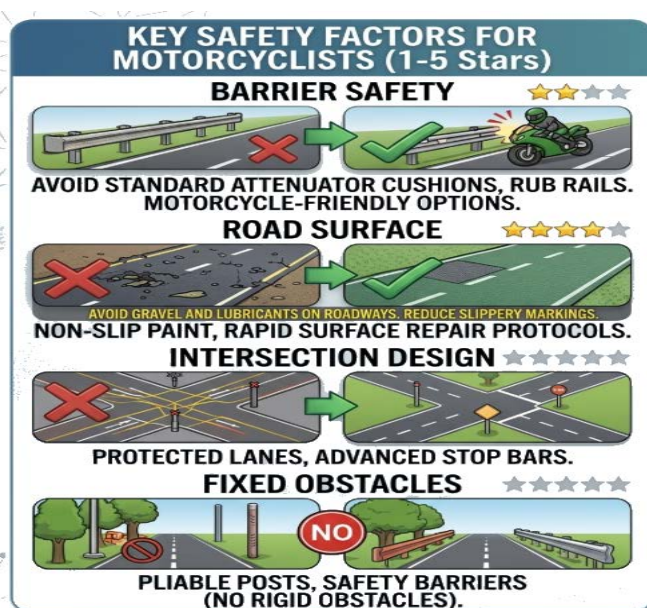


Figure 7: Key safety factor rating according to the iRAP.

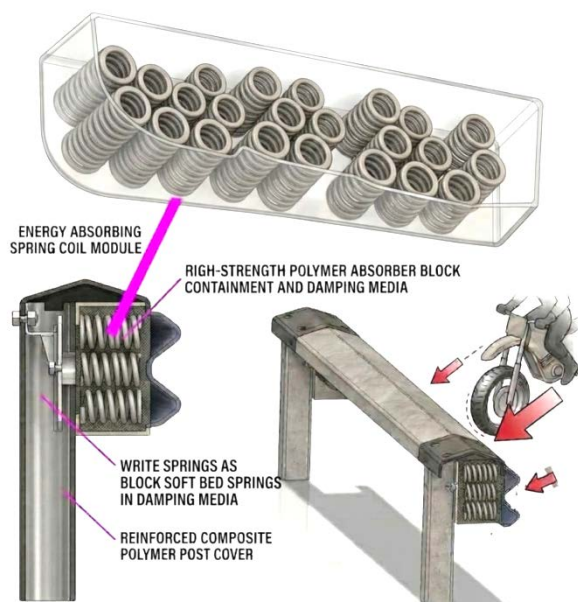


Figure 8: The proposed spring barriers for absorbing the energy from a motorcycle.

Policy focus has primarily been on behavioral interventions, while infrastructure enhancements have received relatively little attention. However, the roadside environment—

comprising fixed objects, unprotected dangers, and poorly designed intersections—plays a crucial role in determining whether a crash results in a fatality.

The UNRSF Motorcycle Star Rating initiative, which addresses both vehicle and infrastructure elements, offers a more comprehensive approach than previous interventions. However, significant investment and long-term planning are necessary for infrastructure improvements—commitments that have not always been fulfilled.

## 5.5 The Regional Harmonization Opportunity

The focus of the UNRSF initiative on regional harmonization holds significant strategic value. By creating uniform standards for motorcycle safety assessments, the program establishes a framework that allows national governments to implement coordinated regulations.

For consumers, the star rating system offers easily accessible information that can impact their purchasing choices. For manufacturers, having a single regional standard simplifies compliance requirements. For governments, this initiative provides the necessary evidence to facilitate regulatory improvements.

The involvement of Thailand and Vietnam as initial phase countries presents an opportunity for collaborative learning and the sharing of technical resources. Nevertheless, the success of the initiative will rely on ongoing political commitment and sufficient funding.

## 6 Conclusions

This study analyzes motorcycle accident patterns in Thailand and Vietnam reveals both the scale of the crisis and the contours of potential solutions. The two nations share fundamental characteristics: motorcycle-dependent mobility, regulatory frameworks that are incompletely implemented, and an urgent need for sustained, evidence-based intervention.

Yet the national trajectories diverge. Vietnam's substantial post-2007 helmet compliance gains—whatever their subsequent erosion—demonstrate that rapid, large-scale behavioral change is possible with political commitment and visible enforcement. Thailand has low compliance, causing 86.8% of fatally injured riders not to wear helmets. This indicates a catastrophic failure of the approaches.

The June 2025 enforcement enhancement in Thailand is a necessary but not sufficient step. Fine increases and intensified enforcement can produce short-term compliance gains, but sustained improvement requires complementary interventions: public awareness campaigns addressing risk perception, helmet quality regulation, alcohol enforcement, infrastructure improvements, and vehicle safety technology requirements.

The UNRSF Motorcycle Star Rating initiative offers a framework for regional coordination [1]. By establishing common standards for vehicle assessment, consumer information, and regulatory guidance, the initiative can accelerate the adoption of proven safety technologies and practices across the ASEAN region.

Ultimately, the goal is measurable and urgent: to reduce the 17,900 annual road deaths in Thailand and the lives lost daily on Vietnamese roads. The interventions required are known. The political will to implement them at scale has, in the past, faltered. The question is not what to do but when—and how many more lives will be lost in the interim.

Thailand and Vietnam are at a crossroads. While Vietnam has achieved a 47% decrease in fatalities over the last 15 years [2.1], Thailand's high-speed highway culture remains difficult to regulate. The future of motorcycle safety in both countries lies in the Digital-Physical Nexus: using AI-driven traffic management to curb speeding and mandating "Smart Safety" technologies (ABS and high-spec helmets) as a prerequisite for vehicle registration.

## 7 Availability of Data and Materials

All information is included in this article.

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